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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 10/808,193 | 03/24/2004 | Kenichi Koyanagi | NECN 21.087 | 4587 |
| 26304 | 7590 | 04/19/2006 | | |
| KATTEN MUCHIN ROSENMAN LLP 575 MADISON AVENUE NEW YORK, NY 10022-2585 | | | EXAMINER EVERHART, CARIDAD | |
| | | | ART UNIT 2891 | PAPER NUMBER |

DATE MAILED: 04/19/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

HA

Office Action Summary

Application No.

10/808,193

Applicant(s)

KOYANAGI ET AL.

Examiner

Caridad M. Everhart

Art Unit

2891

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-18 is/are pending in the application.
- 4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-18 is/are rejected.
- 7) ☐ Claim(s) ____ is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on ____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
 Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. ____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. ____. |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| Paper No(s)/Mail Date ____. | 6) <input type="checkbox"/> Other: ____. |

Continued Examination Under 37 CFR 1.114

A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 1-30-2006 has been entered.



Applicant's arguments with respect to the claims have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 112

The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

Claims 2-4 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

It seems that the limitations of claims 2-4 are inconsistent with the limitations of claim 1 upon which the claims depend because claim 1 requires a metal film, while claims 2-4

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supply an oxidizing gas on the surface, so that it would seem the layer would be an oxide layer rather than a metal layer.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 6,7, 12, 13, 14, and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Basceri, et al. (US 6,908,639B2).

Basceri, et al disclose the steps of forming a monolayer of metal such as Ta(col. 3, lines 3-8 and col. 1, lines 35-39). The monolayers are of the same species(col. 3, lines 14-18). Then a second layer of tantalum oxide is deposited(col. 4,lines 40-49) The method of depositing the oxide may be CVD(col. 3,lines 63-67). Basceri, et al disclose the forming of a capacitor(col. 4,lines 50-60 and col. 5,lines 47-64). This would include forming bottom electrode, high k dielectric, and top electrode. The precursor for tantalum is either TaCl₅, TaF₅, or TATDMAE(col. 7, lines 37-40). The substrate is a semiconductor wafer, which would include silicon wafer(col. 2, lines 60-67).

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

Claims 2,3, 4, 7, and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Derderian, et al (US 6,458,416B1).

Basceri et al teaches Ti can be one of the deposited metals(claims 25, 34, and 37), but is silent with respect to the recited precursors.

Basceri, et al is silent with respect to the initiation of the precursor.

Derderian et al disclose forming an initiation precursor layer before the deposition of the precursor in atomic layer deposition(col. 3, lines 29-35). The initiator may be water(col. 6, lines 10-15). The temperature is at raised temperature, so that the water is a heated vapor(col. 6, lines 20-25). Derderian teaches TMA ($\text{Al}(\text{CH}_3)_3$) as a precursor(col. 5, lines 40-45).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have combined the steps taught by Derderian et al with the steps taught by Basceri et al in order to form the better sticking of the layer taught by Derderian et al and without defects as taught by Derderian et al (col. 1, lines 14-16). Derderian et al teach that TMA is a known precursor for ALD and therefore would have been obvious to choose TMA for one of ordinary skill in the art. It would have been obvious to one of ordinary skill in the art at the time of the invention to have used the recited precursors because Basceri et al teaches the precursors for Ta, and the same ligands for the Ti would have been obvious to one of ordinary skill in the art.

Claim 5 is rejected under 35 U.S.C. 103(a) as being unpatentable over Basceri et al in view of Derderian et al as applied to claims 1 and 2 above, and further in view of Dean, et al(US 2005/0009335A1).

Basceri et al in view of Derderian et al is silent with respect to HF treatment.

Dean et al discloses the HF treatment of a silicon substrate prior to ALD (paragraph 0065).

It would have been obvious to one of ordinary skill in the art to have used HF as taught by Dean et al in the process taught by Basceri et al in view of Derderian et al because Basceri et al in view of Derderian et al teach a treatment in order to terminate the substrate, and the use of HF as taught by Dean et al would result in an H-terminated silicon substrate.

Claim 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Basceri et al in view of Derderian et al as applied to claims 1 and 2 above, and further in view of Elers (US 6,767,582).

Basceri et al in view of Derderian et al is silent with respect to the recited compounds.

Elers discloses the use of NbCl₅ in ALD(col. 9, lines 23-50).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have used the material taught by Elers in the process taught by Basceri et al in view of Derderian et al because NbCl₅ is taught by Elers because the compounds are known in the ALD art.

Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Basceri, et al in view of Derderian et al as applied to claims 1 and 2 above, and further in view of Metzner, et al (US 6,858,547).

Basceri et al in view Derderian et al is silent with respect to the recited compounds.

Metzner et al discloses hafnium amido alkyl precursors for ALD(claim 14).

It would have been obvious to one of ordinary skill in the art at the time of the invention to have used the compounds taught by Metzner et al in the process taught by

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Basceri et al in view of Derderian et al because Metzner et al teaches the compounds for ALD.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Caridad M. Everhart whose telephone number is 571-272-1892. The examiner can normally be reached on Monday through Fridays 7:30-4:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, B. Baumeister can be reached on 571-272-1722. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

C. Everhart
4-13-2006

C. Everhart
CARIDAD EVERHART
PRIMARY EXAMINER